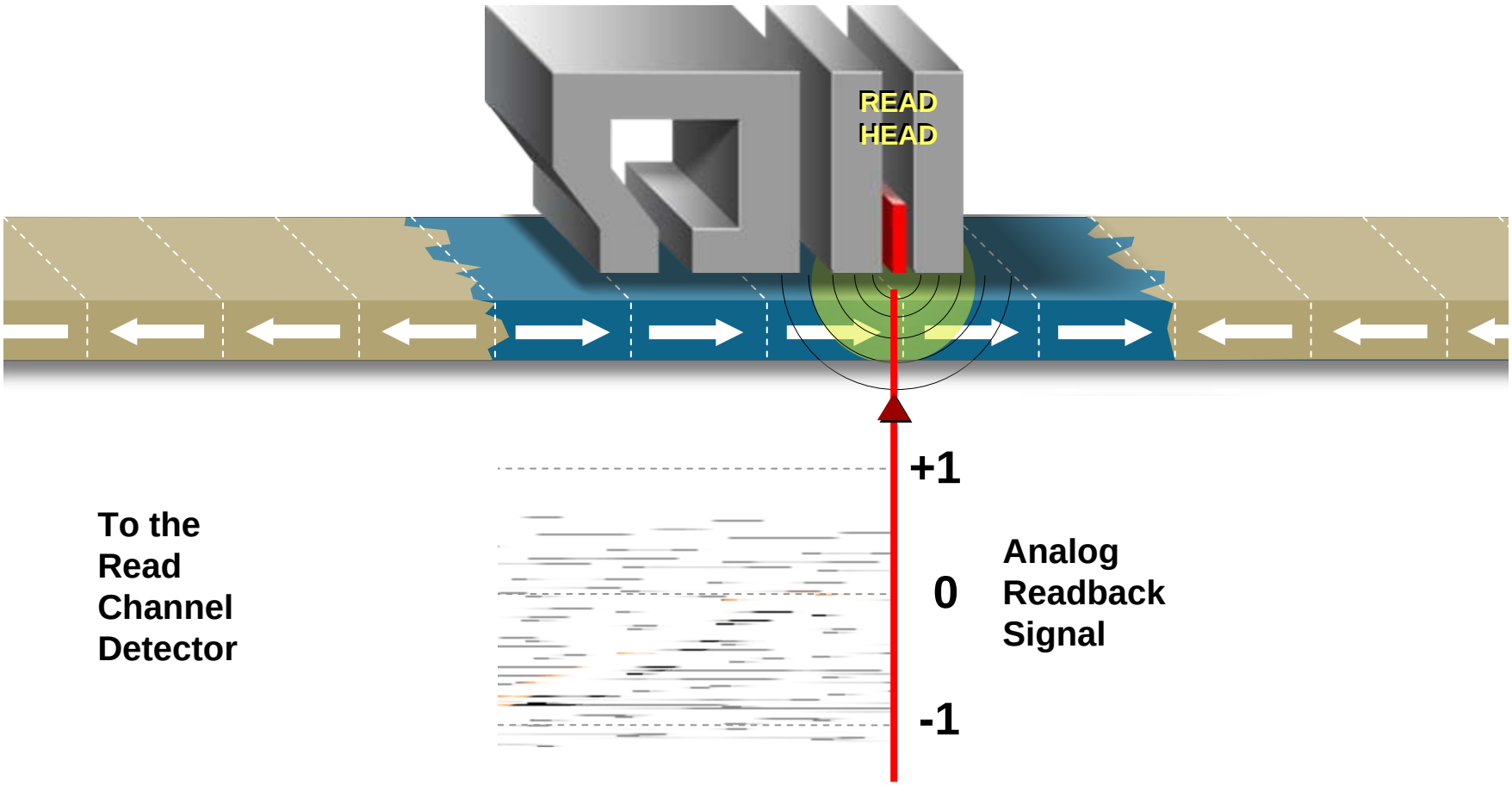
Exhibit A

Part 3

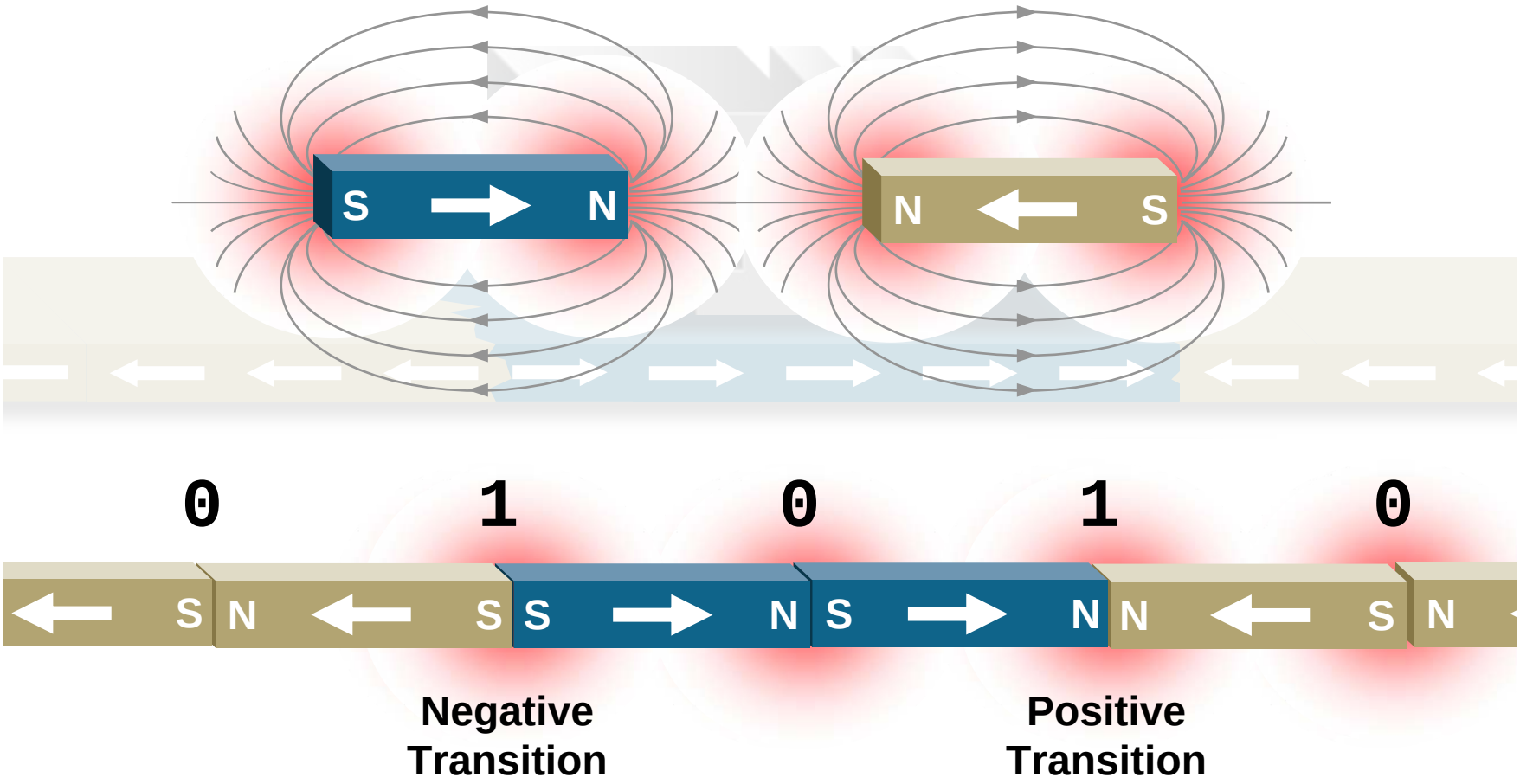
Reading Data on the Hard Disk

The Read Head senses the transitions, converts them to a voltage signal and sends that signal to the Read Channel Detector



Reading Data on the Hard Disk

The strongest electromagnetic field is found at the ends (north pole/south pole) of the bar magnet's

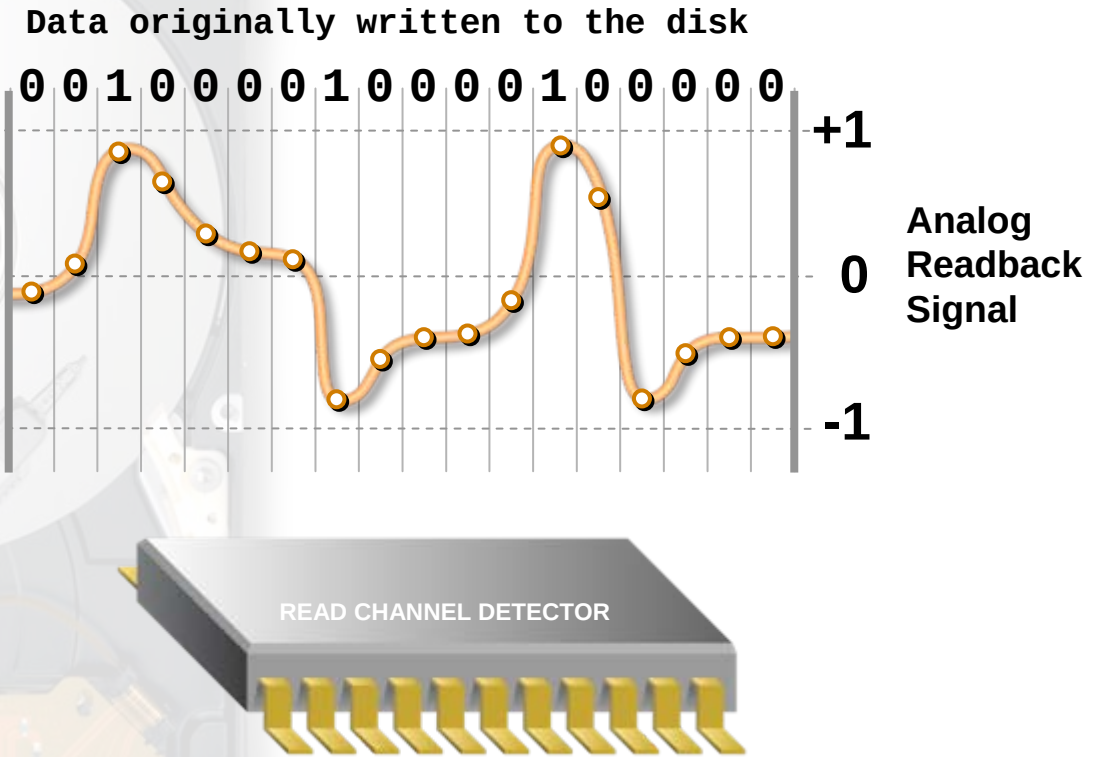


Reading Data on the Hard Disk

Read Channel Detector
Detects the data written to the disk

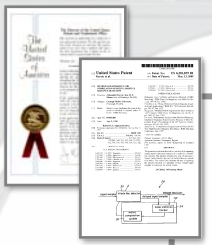
Reading Data on the Hard Disk

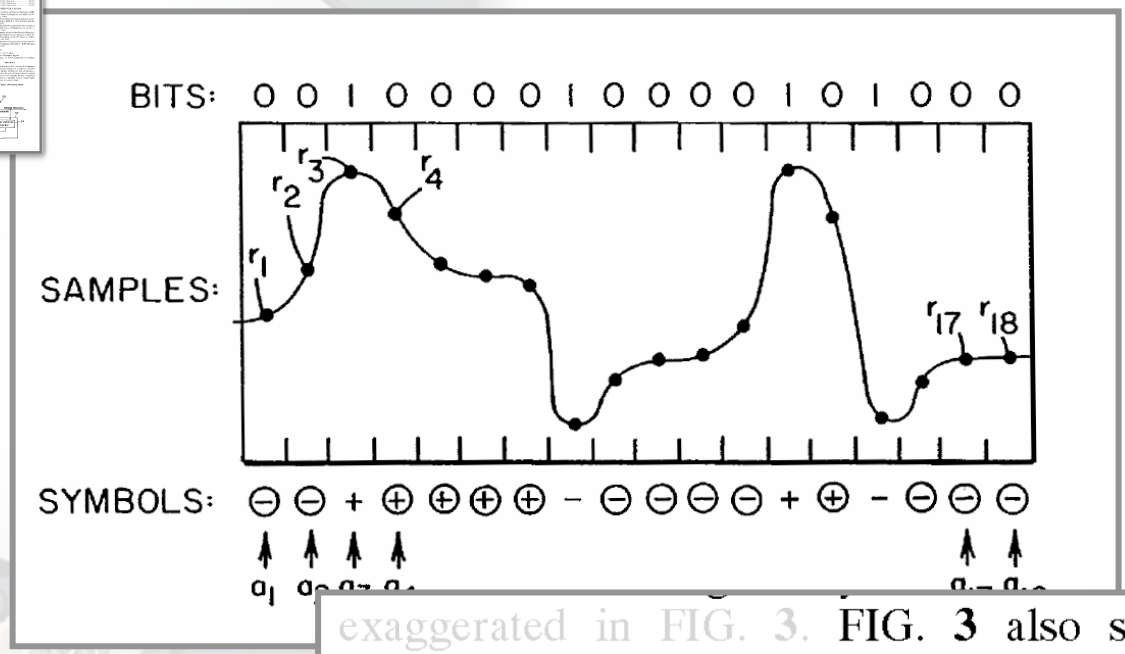
The Read Channel Detector samples the signal at regular time intervals and uses those values to attempt to determine the sequence of data symbols written on the disk



Reading Data on the Hard Disk

The Read Channel Detector samples the signal at regular time intervals and uses those values to attempt to determine the sequence of data symbols written on the disk





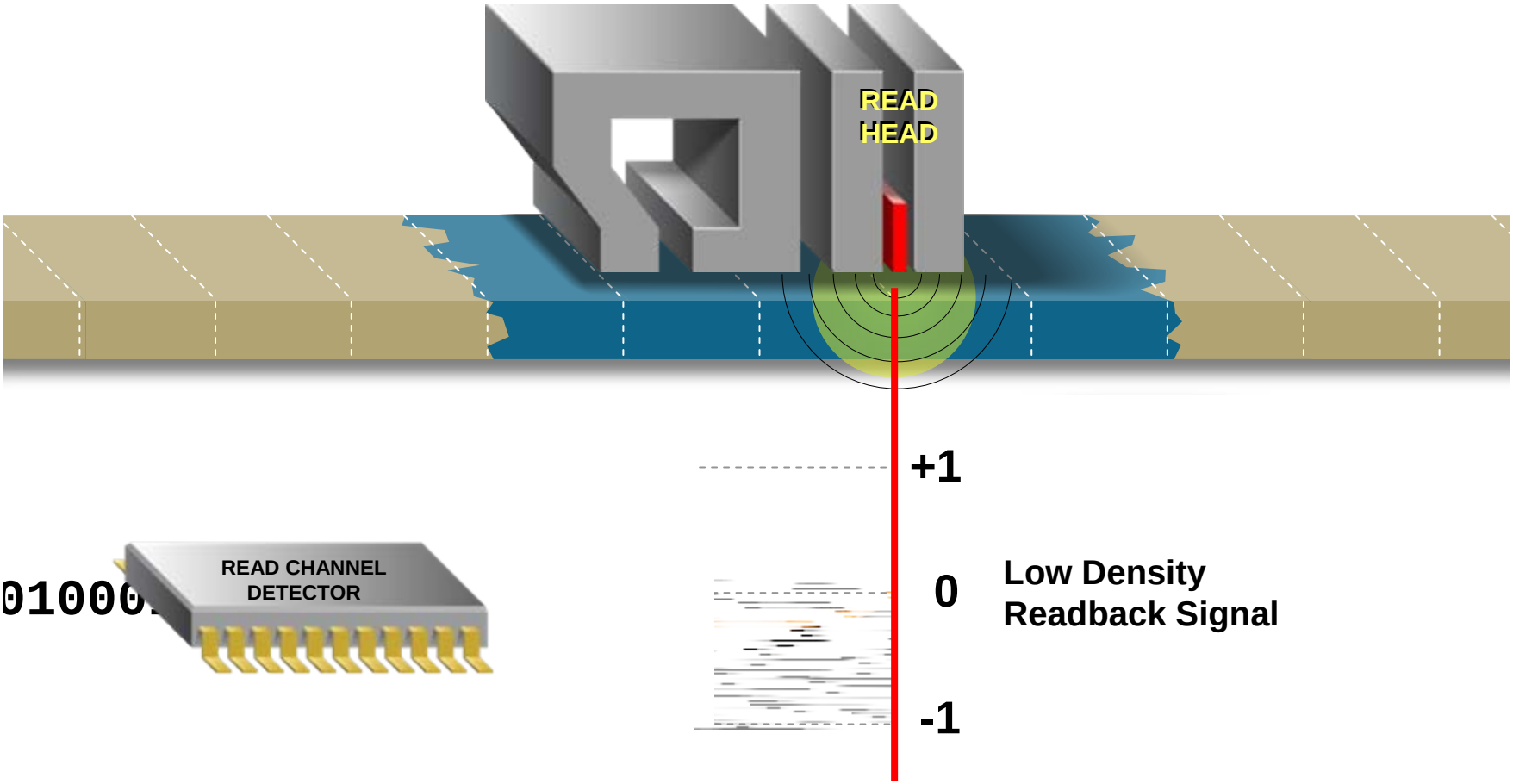
Analog Readback Signal

exaggerated in FIG. 3. FIG. **3** also shows the written symbols $a_1, \ldots, a_{18}$, as well as the samples $r_1, \ldots, r_{18}$ of the read-back waveform, sampled at the rate of one sample per symbol interval.

Source: '839 Patent (3:66-4:2)

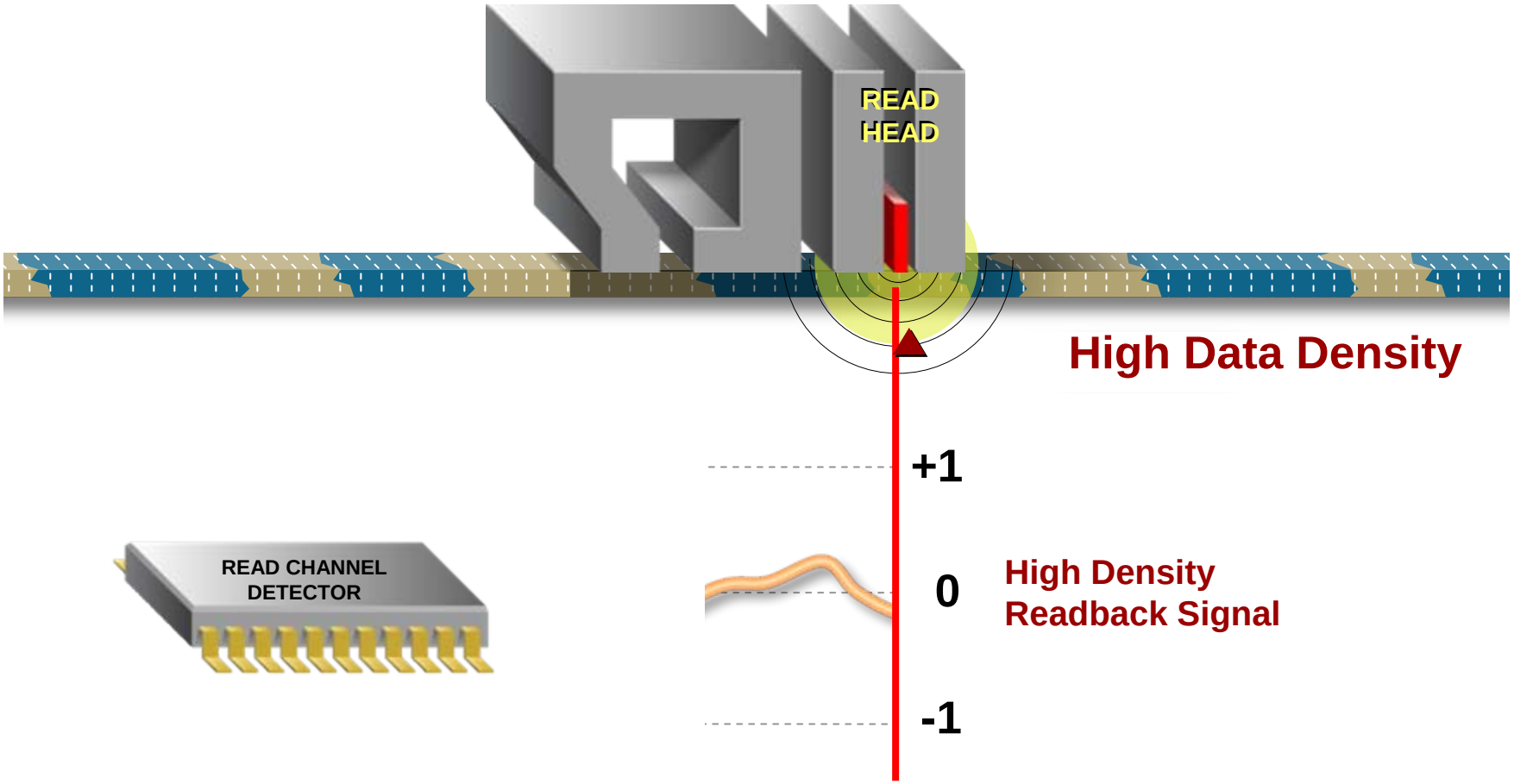
Reading Data on the Hard Disk

**In the past, when data density was much lower,
it was easier to detect the data from the readback signal**



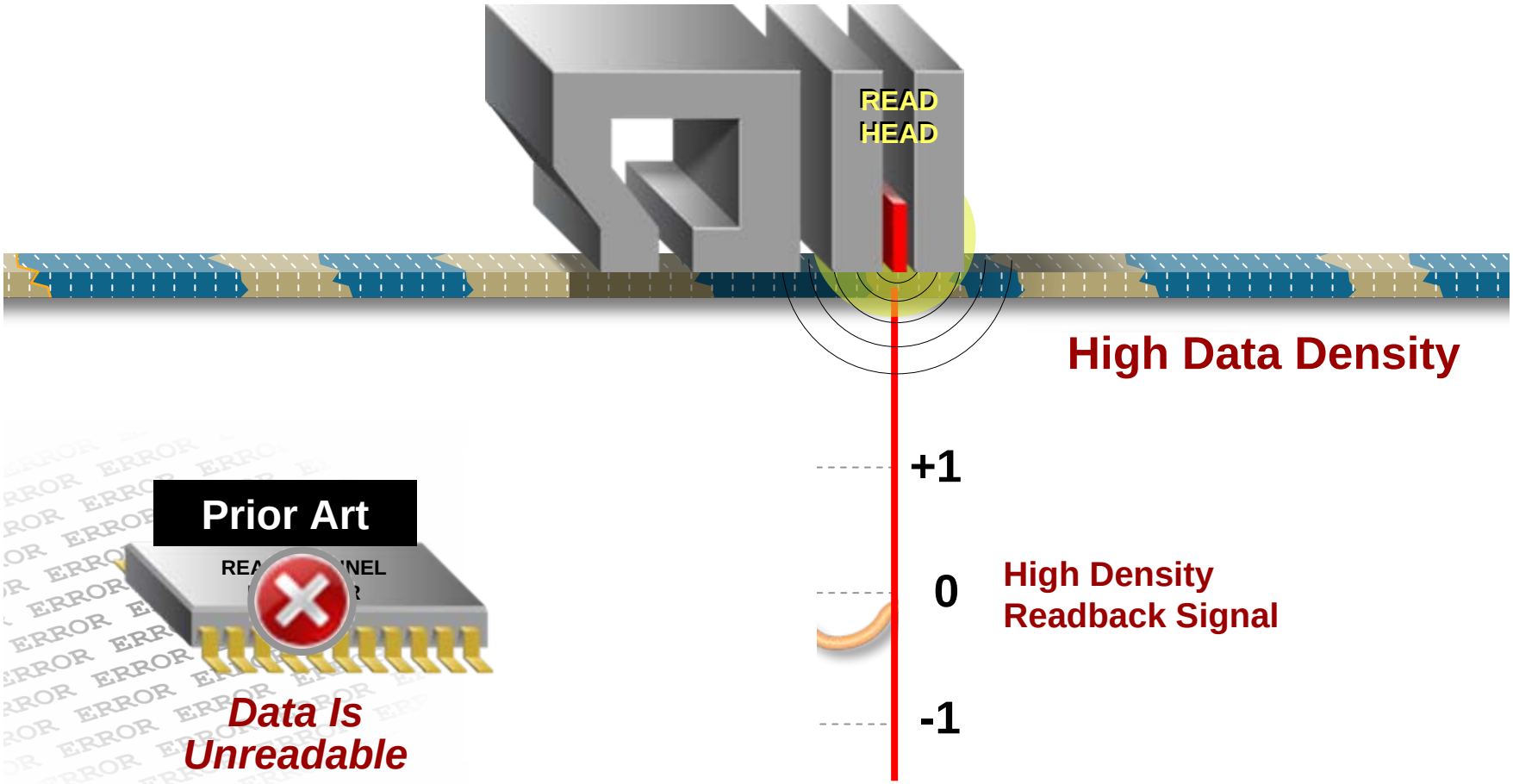
Reading Data on the Hard Disk

As data density increased, the noise became more of a problem and accurate reading became more difficult



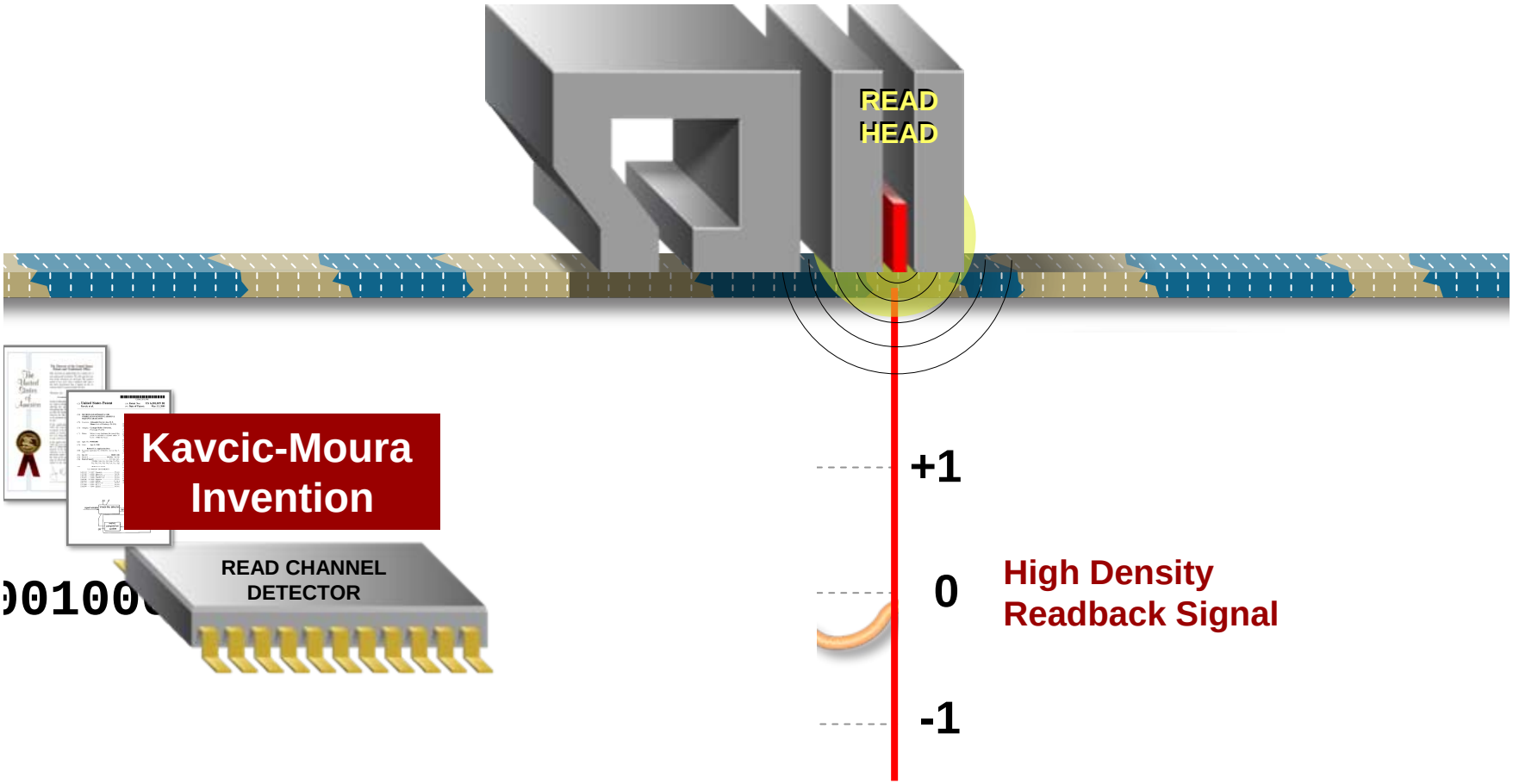
Reading Data on the Hard Disk

As data density increased, the noise became more of a problem and accurate reading became more difficult



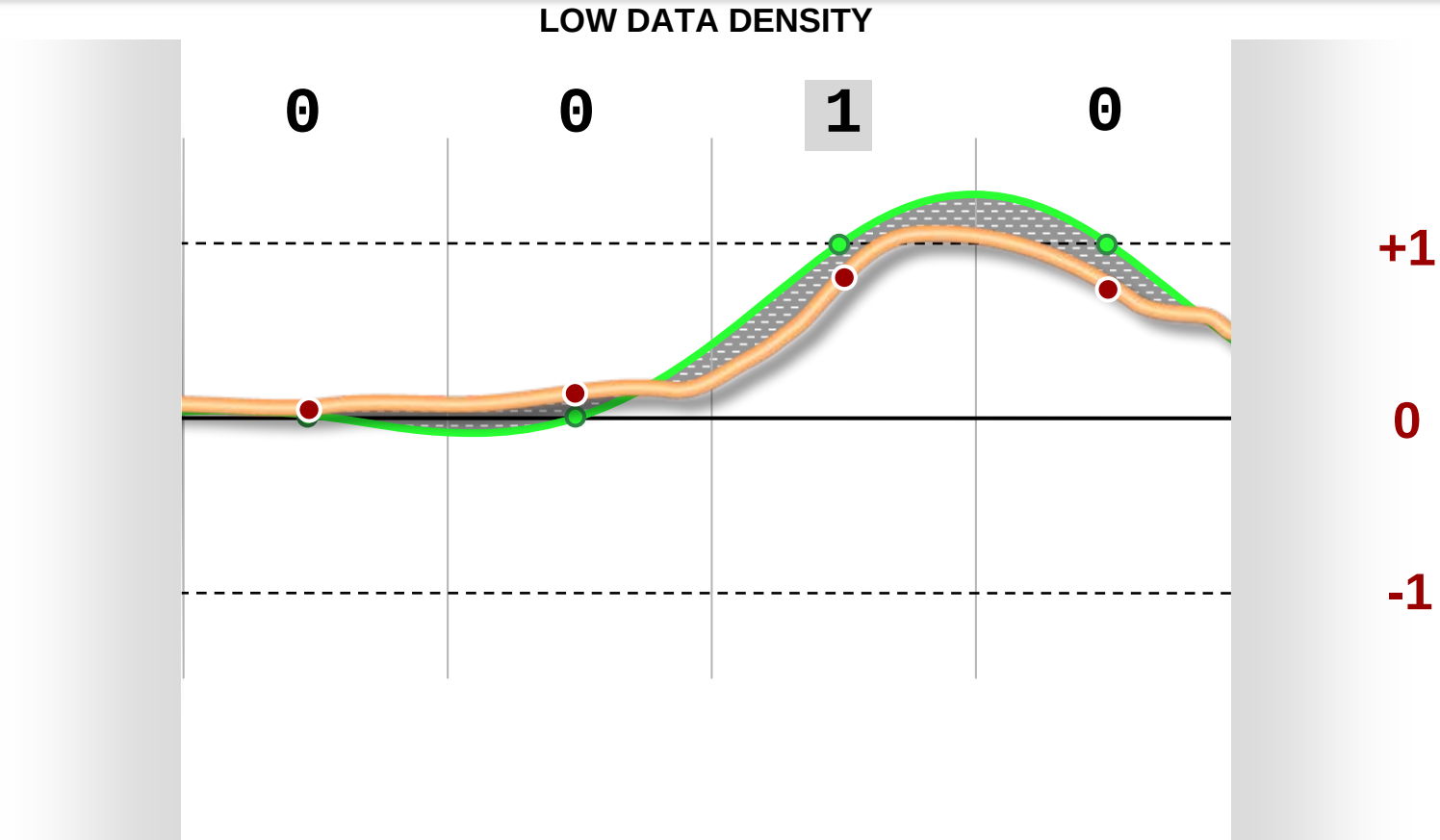
Reading Data on the Hard Disk

The Kavcic-Moura Invention is a detector with the ability to accurately detect digital data from today's high-density hard drives



Noise on a Magnetic Hard Disk

A "Noise-Free" Signal, the Actual Readback Signal, and the Noise

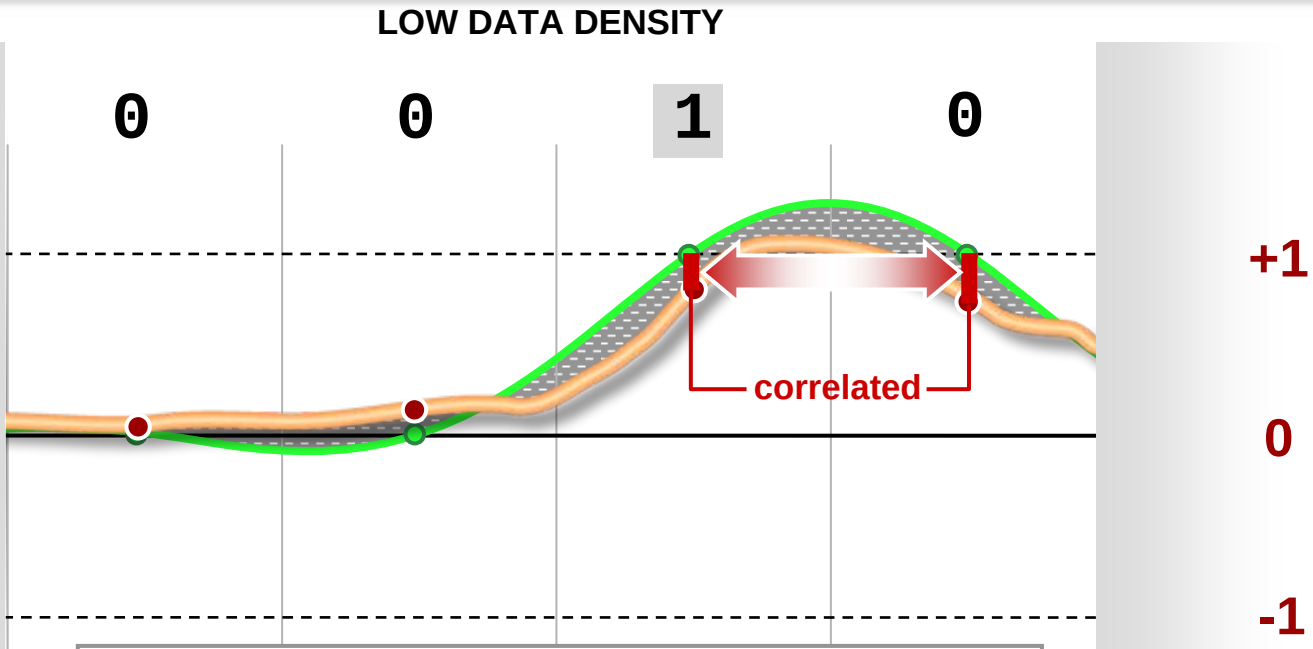


Hypothetical "Noise-Free" Signal for this bit pattern

Actual Readback Signal generated by the Read Head

Noise

Correlated Noise



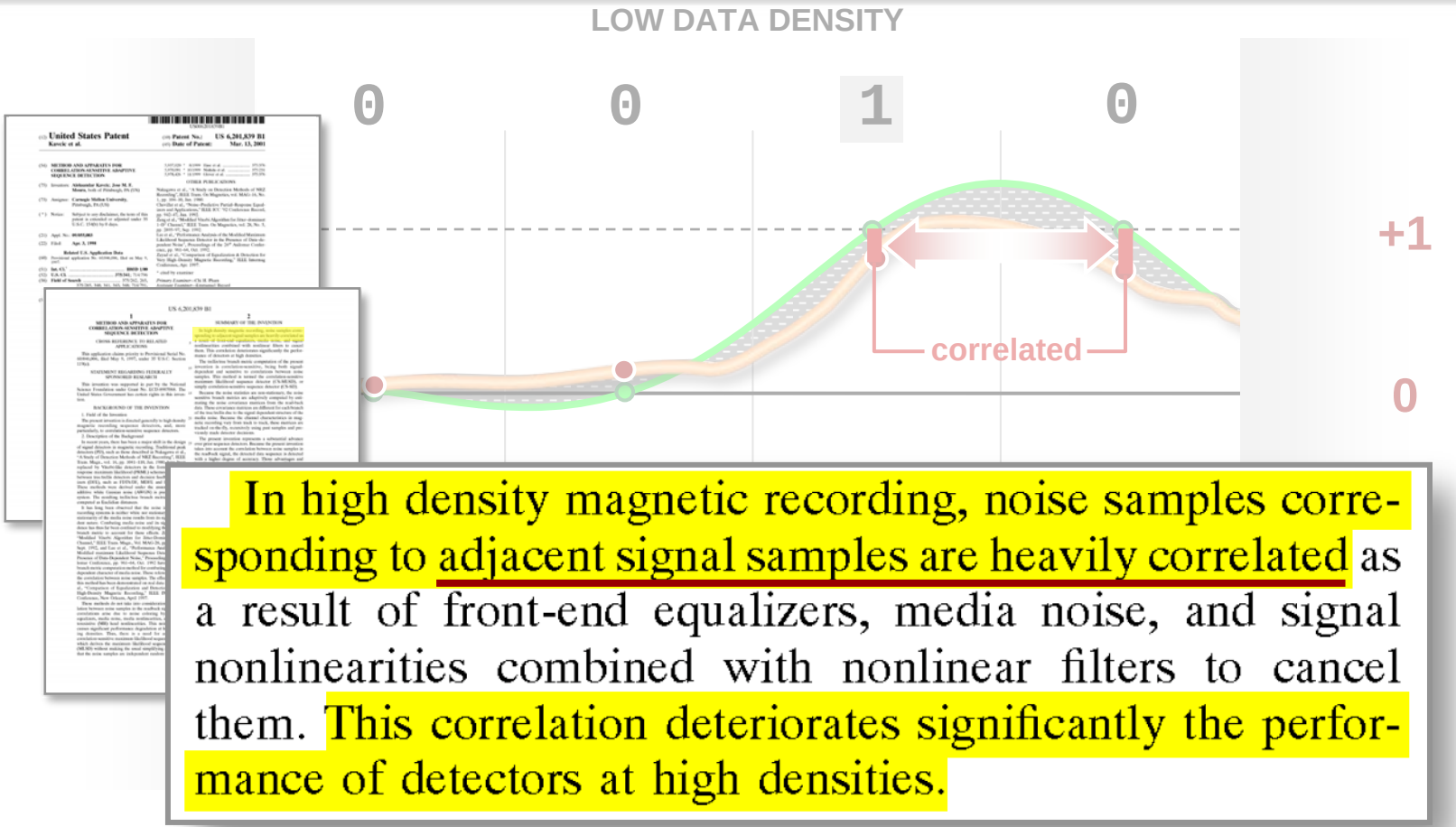
For example:
A deviation from the ideal readback signal for one bit reading is correlated to (varies together with) nearby deviations

Hypothetical “Noise-Free” Signal for this bit pattern

Actual Readback Signal generated by the Read Head

Noise

Correlated Noise



In high density magnetic recording, noise samples corresponding to adjacent signal samples are heavily correlated as a result of front-end equalizers, media noise, and signal nonlinearities combined with nonlinear filters to cancel them. This correlation deteriorates significantly the performance of detectors at high densities.

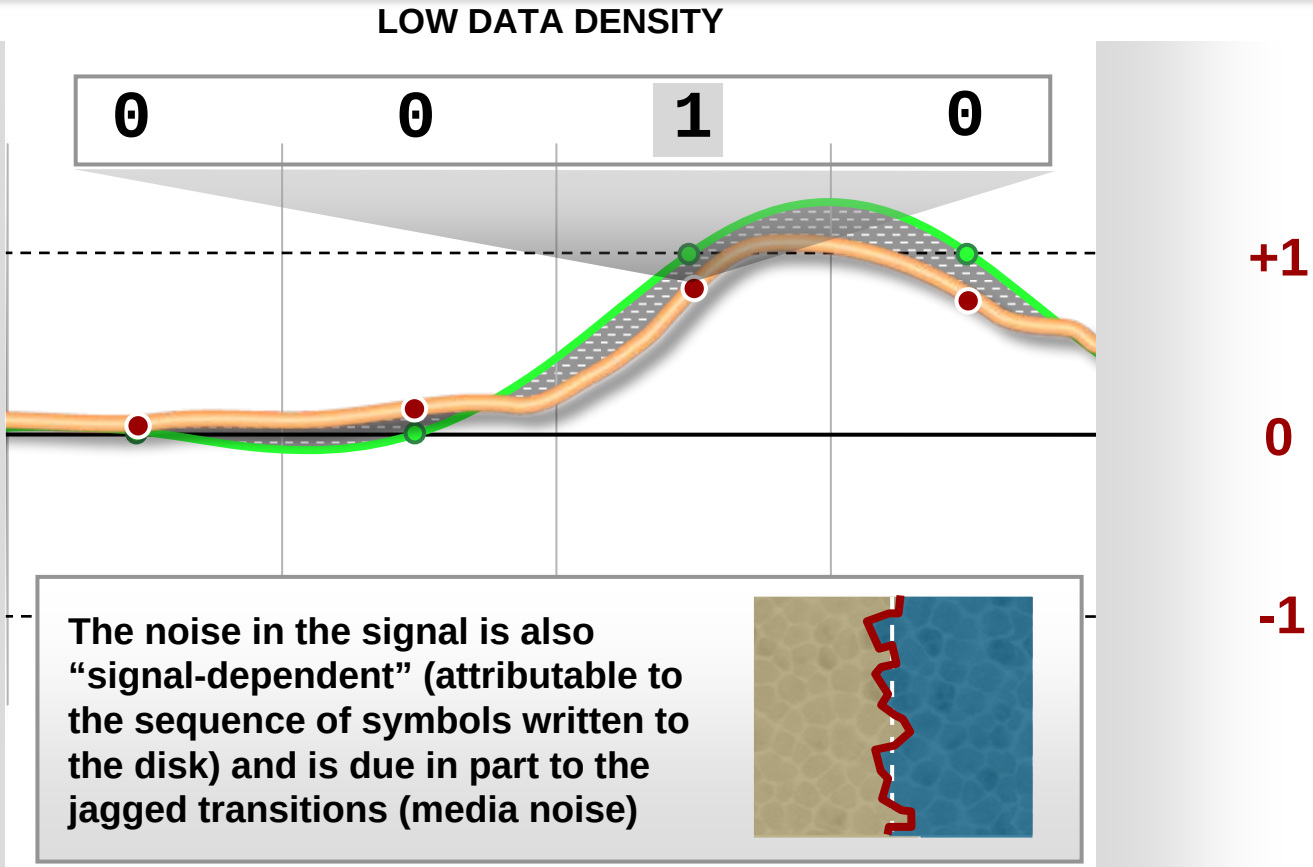
Hypothetical "Noise-Free" Signal for this bit pattern

Actual Readback Signal generated by the Read Head

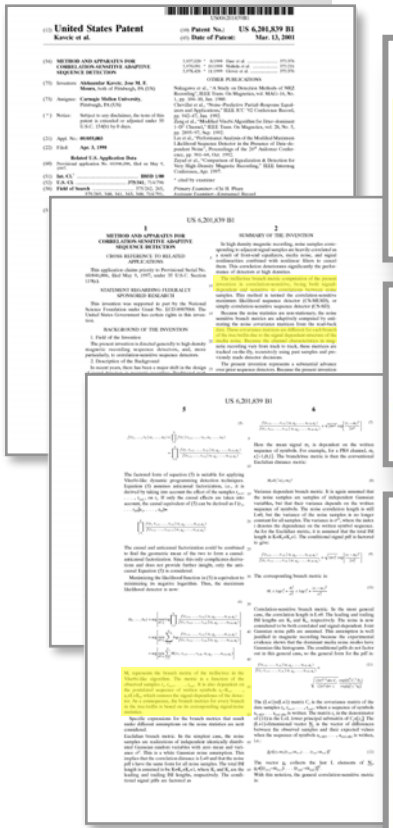
Noise

Source: '839 Patent (2:2-7)

Signal Dependent Noise



Signal Dependent Noise



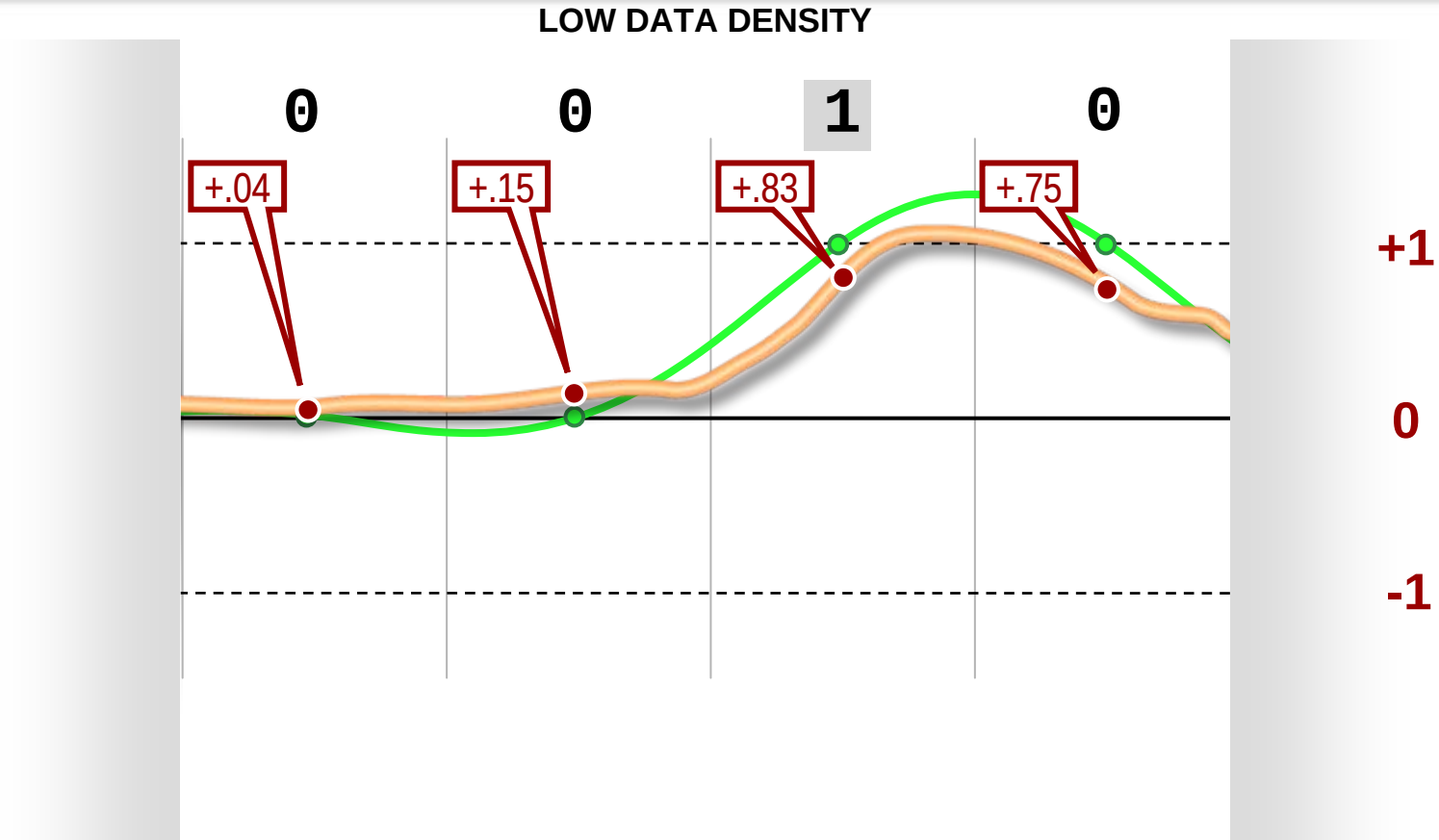
The trellis/tree branch metric computation of the present invention is correlation-sensitive, being both signal-dependent and sensitive to correlations between noise samples. This method is termed the correlation-sensitive

data. These covariance matrices are different for each branch of the tree/trellis due to the signal dependent structure of the media noise. Because the channel characteristics in mag-

M_i represents the branch metric of the trellis/tree in the Viterbi-like algorithm. The metric is a function of the observed samples $r_i, r_{i+1}, \ldots, r_{i+L}$. It is also dependent on the postulated sequence of written symbols $a_i-K_1, \ldots, a_i+L+K_t$, which ensures the signal-dependence of the detector. As a consequence, the branch metrics for every branch in the tree/trellis is based on its corresponding signal/noise statistics.

Source: '839 Patent
(2:9-12,18-20; 5:48-55)

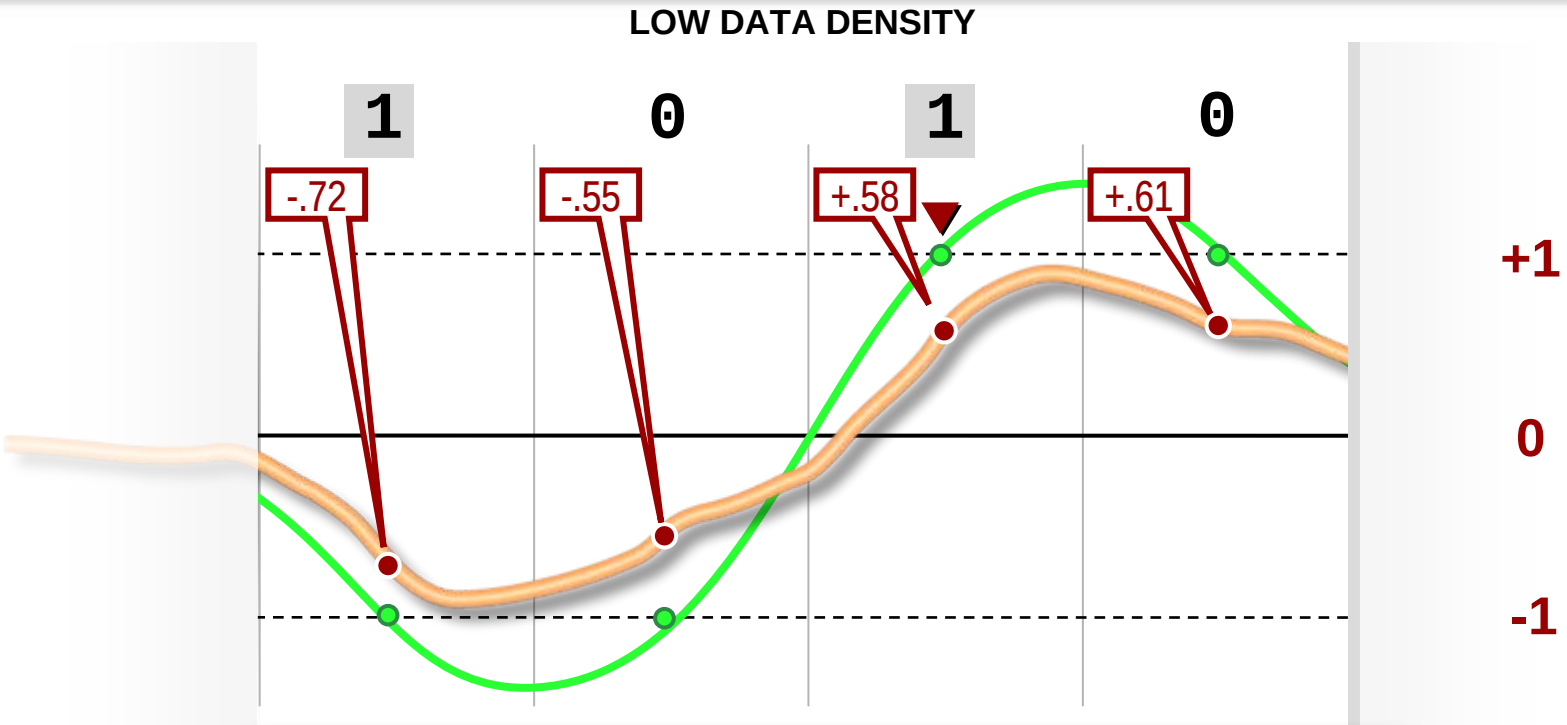
Signal Dependent Noise



Hypothetical “Noise-Free” Signal for this bit pattern

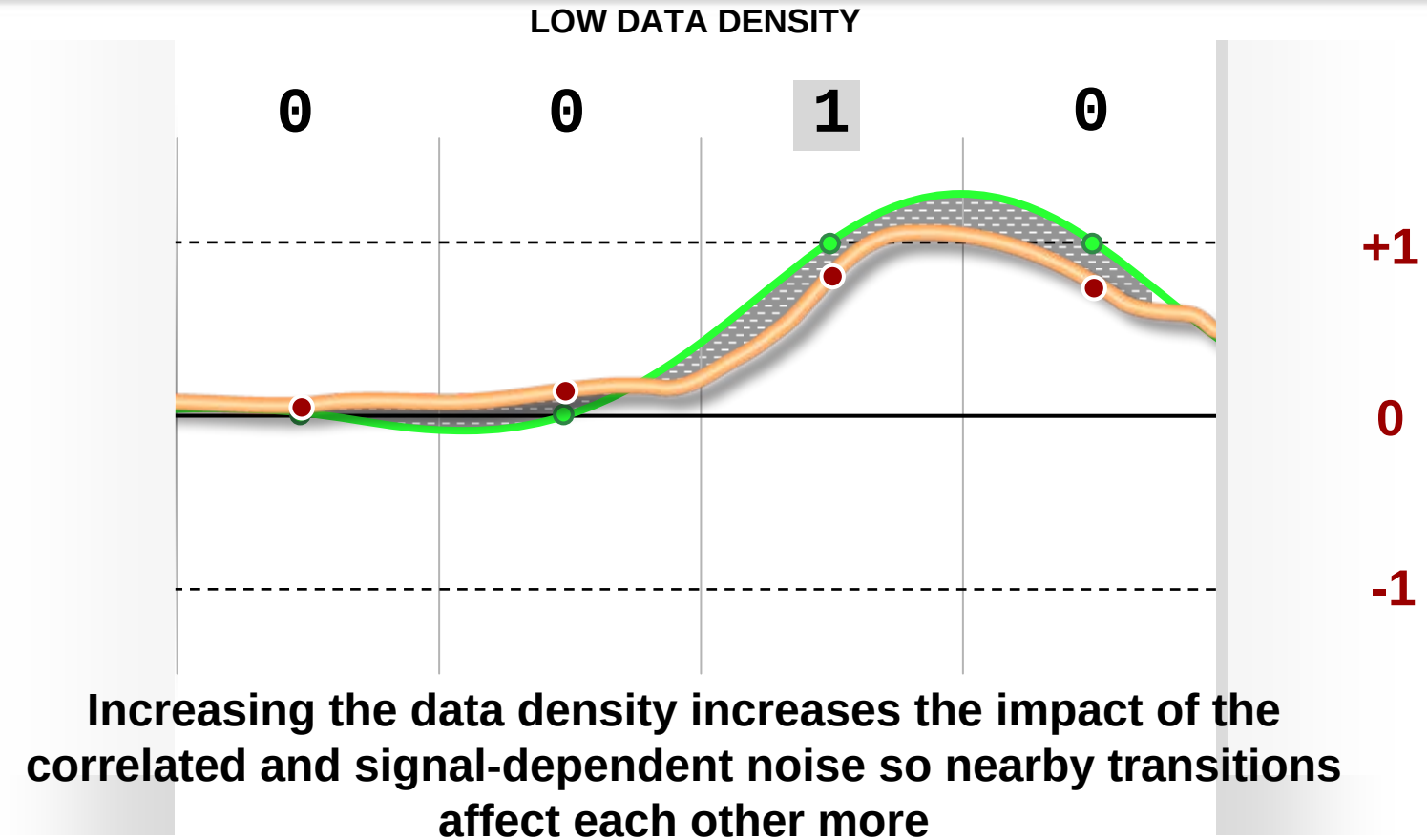
Actual Readback Signal generated by the Read Head

Signal Dependent Noise



Source: '839 Patent (2:18-20)

The Impact of the Noise Increases in High-Density Environments

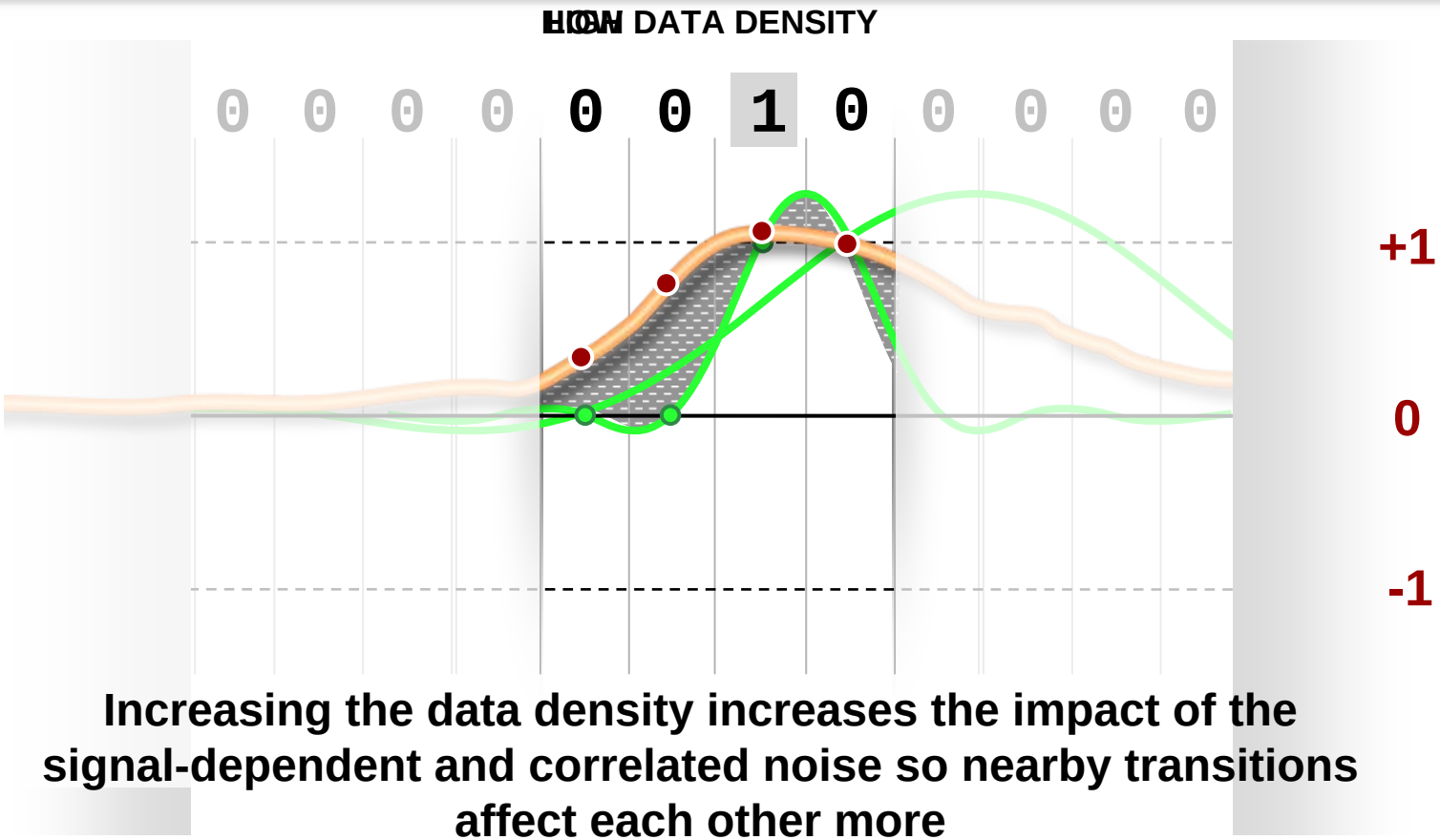


Increasing the data density increases the impact of the correlated and signal-dependent noise so nearby transitions affect each other more

Hypothetical “Noise-Free” Signal for this bit pattern

Actual Readback Signal generated by the Read Head

The Impact of the Noise Increases in High-Density Environments



Increasing the data density increases the impact of the signal-dependent and correlated noise so nearby transitions affect each other more

Hypothetical “Noise-Free” Signal for this bit pattern

Actual Readback Signal generated by the Read Head